

The Dytiscidae, Gyrinidae, Haliplidae, Hydrochidae, Aquatic Hydrophilidae, and Noteridae (Insecta: Coleoptera) of the North Tract of the Patuxent Research Refuge, Maryland

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ABSTRACT

Inventory work conducted at Patuxent Research Refuge, Laurel, Maryland from March 1999 to October 2001 found 17 species of Dytiscidae, two species of Gyrinidae, six species of Haliplidae, one species of Hydrochidae, 17 species of aquatic Hydrophilidae, and one species of Noteridae. These 44 species represent 23.6% of the known Maryland fauna of these families. The most unusual finds were the woodland pool specialists *Hoperius planatus* Fall and *Agabetes acuductus* (Harris) (Dytiscidae), candidates for Maryland threatened/endangered species status.

Key words: aquatic species, Coleoptera, Dytiscidae, Gyrinidae, Haliplidae, Hydrochidae, Hydrophilidae, Maryland, Noteridae, Patuxent Research Refuge.

INTRODUCTION

Aquatic insects are an extremely important but under-appreciated resource. These insects, important in the diet of fish and waterfowl (Wilson, 1923), are predators on other aquatic invertebrates (Wilson, 1923), are indicators of water quality (Brown, 1972), and have been proposed as indicators of overall biodiversity (Ribera & Forster, 1993; Sánchez-Fernández et al., 2006).

Aquatic Coleoptera in many regions of North America have not been thoroughly inventoried and the biogeography of aquatic beetles is poorly understood (Hilsenhoff, 1991). There is a need for inventories of the aquatic beetles of the mid-Atlantic states with an emphasis on sampling as many different habitats as possible. This project was undertaken to help meet this need.

The Patuxent Research Refuge (39.08168°N 76.77217°W) was established in 1936 and presently contains 5162 ha. The Refuge is mostly forested, but contains meadow and wetland habitats as well. It is divided into three tracts. The work here summarized

was conducted on the 3279 ha North Tract that was transferred to the Refuge from Fort George C. Meade in 1991.

Aquatic resources in the North Tract include the Patuxent and Little Patuxent rivers, numerous small streams, permanent and temporary ponds, marshes, swamps, and seasonal wetlands.

The purposes of this study were to collect and identify aquatic beetles in as many aquatic habitats as possible and to develop baseline data upon which to monitor and manage the natural resources of the Refuge.

METHODS

A standard aquatic net was used along pond, stream, and river margins as well as in the deeper or more interior sections. The "floatation" method involved stirring and agitating the submerged leaf litter along the pond, pool or stream margin by hand and holding it submerged for about a minute, causing beetles, especially smaller species, to float to the surface where they were easily visible and could be captured with a

fine-mesh net. Blacklights were also used to capture numerous species. No formal attempt was made to sample for a specified period of time, nor was any effort made to capture terrestrial hydrophilid species. Field work was conducted from March 1999 to October 2001.

RESULTS

A total of 44 species was found, including 17 Dytiscidae, two Gyrinidae, six Haliplidae, one Hydrochidae, 17 aquatic Hydrophilidae, and one Noteridae. In the following listing of species, each entry contains a general habitat description, endangerment status in Maryland, and details of specific collections on the refuge. Voucher specimens were deposited in the collection of the National Museum of Natural History, Smithsonian Institution.

Dytiscidae

Acilius fraternus (Harris) is most often collected in shaded ponds and pools with some leaf litter and no vegetation; it is also found in lakes, ditches, streams, and swamps; adults are taken at lights (Michael & Matta, 1977; Larson et al., 2000; Ciegler, 2003; Bergsten & Miller, 2006). Specimens were collected at blacklight in May 2001.

Agabates acuductus (Harris) is a woodland pool species found among dense leaf litter (Spangler & Gordon, 1973). A single male was collected in flooded woods on 20 April 2000. This species is under consideration for endangered or threatened status in Maryland (Anonymous, 2003).

Agabus aeruginosus Aubé is found in emergent vegetation in marshy areas (Michael & Matta, 1977); it is also found in shallow ponds (Hilsenhoff, 1993) and open temporary pools (Matta, 1986b). Specimens were collected at blacklight in May 2001.

Agabus anthracinus Mannerheim is found in grassy margins of ponds (Michael & Matta, 1977) and other permanent lentic habitats (Hilsenhoff, 1993). Larson (1989) reported that the species is usually found in dense emergent vegetation. Specimens were collected among emergent vegetation in ponds in July 1999.

Agabus gagates Aubé is most commonly found in woodland pools, generally where the water is shaded and cool and has an accumulation of organic debris on a soft substrate; it is also found in beaver ponds, flooded pastures, tire ruts, and stream margins; adults are attracted to lights (Michael & Matta, 1977; Larson et al., 2000; Ciegler, 2003). Specimens were collected in woodland pools in April and June of 2000.

Bidessonotus inconspicuus (LeConte) is found in ditches, marshes, ponds, streams, woodland pools, and adults are taken at light (Larson et al., 2000; Williams et al., 2007). Specimens were collected in roadside ditches in April 2000.

Copelatus chevrolati Aubé is a pioneer species found in just about any aquatic situation (Zuellig et al., 2006). Specimens were collected at blacklight in July 1999.

Copelatus glyphicus (Say) is another pioneer species that is abundant in temporary pools; adults are commonly taken at lights (Spangler, 1962). It feeds on copepods, ostracods, ceratopogonid larvae, and *Podura aquatica* L. (Insecta: Collembola) (Spangler, 1962). Specimens were collected in temporary pools in May and June of 2000 and 2001.

Coptotomus interrogatus (Fabricius) is found in ponds, ditches, and lakes; adults are attracted to light (Ciegler, 2003). Barman (2004) reported that this species breeds in temporary pools. Specimens were collected in ponds in July 1999.

Hopierius planatus Fall is an uncommon species found in woodland pools lacking emergent vegetation but containing decaying leaves (Spangler, 1973); adults are taken at lights (Ciegler, 2003). Two specimens were taken at blacklight on 1 June 2000. This is the second record of the species west of the Chesapeake Bay in Maryland. It is under consideration for endangered or threatened status in Maryland (Anonymous, 2003).

Hydrocolus oblitus (Aubé) is found in small, sandy-bottomed streams, cool springs (Larson et al., 2000), and moss in seepages (Ciegler, 2003). Specimens were collected in temporary pools in April and May of 2000 and 2001.

Hydroporus niger Say is found among emergent vegetation in sunny ponds, pools, ditches, swamps, marshes, and other lentic habitats (Barman, 1972; Hilsenhoff, 1995a; Ciegler, 2003; Williams et al., 2007). Specimens were taken in temporary pools in April 2000.

Hygrotus sayi Balfour-Brown is found in a wide variety of aquatic habitats but most often in small pools (Hilsenhoff, 1994), ponds and bogs with weeds and algae (Barman, 1972). Specimens were collected in temporary pools in April 2000.

Laccophilus maculosus maculosus Say is a pioneer species, often the first to find a new body of water. It is found in both forested and grassland shallow pools and ponds usually with emergent vegetation; adults are collected at blacklight (Zimmerman, 1970; Michael & Matta, 1977; Larson et al., 2000; Ciegler, 2003). Specimens were collected in ponds in July 1999.

Matus bicarinatus (Say) is found in ponds and streams (Young, 1953); woodland ponds as well as in

unshaded ponds and roadside ditches; adults are collected at lights (Spangler & Gordon, 1973). Hilsenhoff (1993) collected this species from permanent ponds and marshes which were near or associated with larger streams. Alarie et al. (2001) reported this species in ponds among cattails and decaying leaves; the larvae burrow in mud. Specimens were collected in July 2001 in ponds.

Neoporus clypealis (Sharp) is found in streams of various sizes, backwaters, spring ponds, and ponds adjacent to streams, rarely in other types of ponds or ditches (Hilsenhoff, 1995a); it is also found in emergent vegetation along the margins of slow marshy streams, in beaver ponds, small lakes (Larson et al., 2000), rivers, and swamps; adults are attracted to lights (Ciegler, 2003). Specimens were taken at blacklight in June 2000.

Neoporus undulatus (Say) is found in ditches, rivers, lakes, pools, ponds, swamps, and marshes; adults are attracted to blacklight (Barman, 1972; Ciegler, 2003; Williams et al., 2007). Hilsenhoff (1995a) reported the species as most common in permanent ponds but also in ditches and stream margins. Specimens were taken in temporary pools in May 2001.

Gyrinidae

Dineutus discolor Aubé is found in streams, lakes, rivers, creeks, and swamps (Hilsenhoff, 1990; Ciegler, 2003). Hatch (1925) reported that adults are found in slowly moving streams or slowly flowing areas of swifter streams. Specimens were collected in ponds in May 2001.

Dineutus emarginatus Say is found in ponds, lakes, slow moving rivers and swamps; adults are attracted to lights (Ciegler, 2003; Realzola et al., 2007). King et al. (2000) found this species in cypress-gum swamps. Specimens were collected in ponds in July 1999.

Haliplidae

Haliplus fasciatus Aubé has been collected in permanent pools, temporary pools, the margins of slow-flowing streams, ditches, lakes, ponds, creeks, marshes, and swamps (Matta, 1976a; Ciegler, 2003; Williams et al., 2007; Staines & Mayor, 2008). Specimens were collected in ponds in July 1999.

Haliplus tropsis Say is found in lakes, ponds, rivers, and streams; adults are attracted to light (Hilsenhoff & Brigham, 1978; Ciegler, 2003; Williams et al., 2007). Specimens were collected in ponds in July 1999.

Peltodytes duodecimpunctatus (Say) is frequently collected in ponds (Matta, 1976a), the margins of

streams (Hilsenhoff & Brigham, 1978), and ditches (Williams et al., 2007). Specimens were collected in ponds in July 1999.

Peltodytes edentulous (LeConte) is found at the margins of bodies of permanent standing water (Matta, 1976a) and occasionally along the margins of streams (Hilsenhoff & Brigham, 1978). Specimens were collected in ponds in July 1999.

Peltodytes sexmaculatus Roberts is found in lakes, rivers, ditches, slow streams, pools, and mud flats; adults are taken at lights (Matta, 1976a; Hilsenhoff & Brigham, 1978; Ciegler, 2003). Hickman (1931) found that adults and larvae feed on *Spirogyra* algae. Larvae are found in masses of this algae as they can not swim or float, and must reach the surface to breathe by crawling over the algal surface. Specimens were collected in ponds in July 1999.

Peltodytes shermani Roberts is found in ditches, lakes, rivers, streams, pools, and swamps; adults are attracted to light (Ciegler, 2003; Williams et al., 2007). Faulds & Fairchild (1999) reported that this species feeds on *Spirogyra* algae. Specimens were collected in ponds in July 1999.

Hydrochidae

Hydrochus squamifer LeConte is found in shallow edges of lake and ponds, in swamps, marshes, roadside ditches (Smetana, 1988), and margins of streams (Hilsenhoff, 1995b). Specimens were collected along the margins of ponds in June 2001.

Hydrophilidae

Berosus exiguus Say is usually found in standing water associated with algal mats. Individuals have been collected in ditches, farm ponds, woodland ponds, swamp margins, lake margins, and grass-filled streams; adults are attracted to blacklights (Matta, 1974; Testa & Lago, 1994). However, the species is not commonly found (Van Tassell, 1966). Specimens were collected in temporary pools in May 2000.

Berosus fraternus LeConte is found in a wide variety of aquatic habitats but prefers pools and ponds with a large amount of debris; adults are attracted to lights (Matta, 1974; Ciegler, 2003). Hilsenhoff (1995b) reported the species mostly from permanent ponds and occasionally in streams. Specimens were collected in ditches in July of 1999 and 2000.

Berosus peregrinus (Herbst) prefers quiet water along streams or ditches but is occasionally found in ponds and temporary pools (Van Tassell, 1966; Williams et al., 2007); adults are attracted to lights (Hilsenhoff, 1995b). Specimens were collected at

blacklight in July 1999.

Berosus striatus (Say) inhabits ponds of various types, as well as streams, algal mats, lakes, ditches, marshes, temporary pools, and swamps; adults are attracted to lights (Testa & Lago, 1994; Williams et al., 2007; Staines & Mayor, 2008). Matta (1974) stated that this species seems to prefer deeper water. Specimens were collected at blacklight in June of 2000 and 2001.

Cymbiodyta chamberlaini Smetana is a habitat generalist being found in both lentic and lotic situations (Smetana, 1974). Specimens were collected in ditches in June and July of 1999 and 2000.

Cymbiodyta semistriata (Zimmerman) has been collected at lights (Smetana, 1974) and in temporary pools (Staines & Mayor, 2008). A single specimen was collected in a pond on 22 July 1999.

Enochrus cinctus (Say) is most commonly collected in very shallow, temporary woodland pools with abundant rotting vegetation as well as in marshes, streams, and ditches; adults are attracted to lights (Gunderson, 1978; Testa & Lago, 1994; Hilsenhoff, 1995c; Staines & Mayor, 2008). Specimens were collected at blacklight in July of 1999 and 2001.

Enochrus consors (LeConte) is found in lakes, ponds, swamps, and at lights (Gunderson, 1978). Specimens were collected in temporary pools in May 2001.

Enochrus consortus Green is an uncommon species that is found in pools or ponds with emergent vegetation or a layer of debris on the bottom and swamps and ditches; adults are attracted to lights (Gunderson, 1978; Testa & Lago, 1994; Williams et al., 2007; Staines & Mayor, 2008). Hilsenhoff (1995c) reported this species from ponds, marshes, and the margins of lakes and streams. Specimens were collected at blacklight in July of 1999 and 2000.

Enochrus perplexus (LeConte) is common in temporary pools and ponds of various types, as well as in marshes, bogs, and margins of streams; adults fly readily when taken out of water (Gunderson, 1978; Hilsenhoff, 1995c). Specimens were taken at blacklight in June 2001.

Enochrus pygmaeus nebulosus Say is found in quiet waters with rotting leaves and other plant debris (Gunderson, 1978). Testa & Lago (1994) found this species in every type of aquatic habitat and adults are often taken at lights. Specimens were collected in various aquatic situations from May to July of 1999 to 2001.

Helochares maculicollis Mulsant is found in emergent vegetation at the margins of rivers, lakes, marshes, and ponds (Ciegler, 2003; Williams et al., 2007) and prefers quiet water (Archangelsky, 1997). A single specimen was collected in a pond in June 2001.

Hydrochara obtusata (Say) is found in shallow ponds and marshes (Hilsenhoff, 1995); in ditches (Williams et al., 2007); adults commonly come to lights (Smetana, 1980). Specimens were collected at blacklight from May to August during 1999 to 2001.

Paracymus nanus (Fall) is found in lakes, ponds, emergent vegetation, and at light (Ciegler, 2003). Specimens were collected in ponds in May 2001.

Paracymus subcupreus (Say) is found in a wide variety of aquatic habitats but prefers shallow, standing water with abundant organic matter (Wooldridge, 1966). Smetana (1988) also reports this species from semiaquatic habitats such as wet moss and grass tufts. Adults are attracted to lights (Hilsenhoff, 1995b). Specimens were collected in temporary pools in June 2001.

Tropisternus blatchleyi d'Orchymont seems to prefer shallow pools and ponds but may be found in any quiet water habitat; adults are attracted to lights (Matta, 1974). Testa & Lago (1994) found the species in brackish ponds with salinity from 3.5 to 10.0 ppt. Specimens were collected in ponds in June and July during 1999 and 2000.

Tropisternus collaris (Fabricius) is found in shallow standing water with other *Tropisternus* species; it is commonly found in lakes, ponds, temporary pools, streams, and ditches; adults are attracted to lights (Matta, 1974; Staines & Mayor, 2008). Specimens were collected in pools, ponds, and at blacklight throughout the survey.

Noteridae

Hydrocanthus iricolor Say is a habitat generalist but prefers ponds with debris in the bottom and emergent vegetation; adults are attracted to lights (Staines, 1988; Hilsenhoff, 1992; Ciegler, 2003). Specimens were collected in ponds in July 1999.

DISCUSSION

There are few published inventories of Maryland aquatic beetles. Staines & Staines (2005) reported 42 species from three families from Eastern Neck National Wildlife Refuge. Staines (2008a, b) reported 36 species from three families on Plummers Island. Staines (in press) reported 39 species from six families from Fort Washington and Piscataway National Parks.

Staines (1986a) reported 13 species of Haliplidae, four species of Noteridae, 20 species of Gyrinidae, and 84 species of Dytiscidae from Maryland. Staines (1986b) reported three species of Helophoridae, 13 species of Hydrochidae, and 48 aquatic Hydrophilidae from Maryland. This is a total of 186 species in the

families included in this inventory. The 44 species found at Patuxent Research Refuge represents 23.6% of the known Maryland fauna and suggests a diverse and healthy water beetle fauna for the Refuge. Hopefully, the data reported here will provide a baseline for future monitoring to track changes in populations and species at the Refuge.

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